AMENDMENTS TO THE CLAIMS

Claim 1-22 (canceled)

Claim 23 (currently amended): A method for determining ~~the~~ image quality of an optical imaging system ~~that substantially comprises the following subassemblies: illumination system, including light source, sample holder with sample, imaging optics, and at least one spatially resolving detection device~~, said method comprising the following steps:

~~adjusting the subassemblies relative to one another in such a way that it is possible to image a sample on the detection device;~~

recording an image stack which includes a plurality of individual images of ~~the~~ a sample from different adjusting or reference planes near ~~the~~ a focus plane~~[[,]] wherein the detection device is adjusted relative to the image plane, the sample is adjusted relative to the object plane, or the objective is adjusted relative to the sample~~;

improving ~~the~~ image ~~quality~~ qualities of the individual images of the image stack by means of image processing~~[[,]] particularly to reduce noise, to compensate for local variations in sensitivity of the detection device, and to center the intensity centroids respectively on a predetermined location in the images~~;

~~computational linking spatially resolved image information, adjustment values and system variables relating to the optical imaging system, and information concerning the sample~~ evaluating the image stack with the aim of determining characteristic numbers that are characteristic of ~~the~~ wavefront deformation caused by the imaging system.~~[[;]] and~~

~~outputting the characteristic numbers and associating them with the imaging system as equivalent for the image quality,~~

~~wherein Zernike coefficients are outputted as characteristic numbers, each one being associated with a reference plane.~~

Claim 24 (previously presented): The method according to claim 23,

wherein the characteristic numbers are determined in a first step initially by analytic evaluation and, in a subsequent second step, by further iterative processing of the results from the first step until a given termination criterion is reached.

Claim 25 (currently amended): The method according to claim ~~24~~ 23,

wherein the determination of Zernike polynomials up to a given order is carried out with the analytic evaluation of the image information.

Claim 26 (previously presented): The method according to claim 24,

wherein the determination of Zernike coefficients is carried out with the iterative evaluation of the image information based on methods in which every wave surface from the image stack of the sample is considered as a unit, or a pixel-by-pixel evaluation is carried out, and

wherein the determined Zernike coefficients correspond to the outputted characteristic numbers.

Claim 27 (previously presented): The method according to claim 23,

wherein the change of reference plane always takes place in the object space, i.e., by changing the distance of the sample relative to the object plane.

Claim 28 (currently amended): The method according to claim ~~27~~ 23,

wherein the change of reference plane is carried out in predetermined increments.

Claim 29 (currently amended): The method according to claim ~~27~~ 24,

wherein the number of variables in the iterative step of the evaluation is increased, preferably doubled, in relation to the preceding, analytic step.

Claim 30 (currently amended): The method according to claim ~~23~~ 37,

wherein ~~the sample has a~~ the pinhole ~~with~~ has a diameter d_{PH} = 300 nm, illumination light with the wavelength of 248 nm is used, the pixel size at the sample is 45 nm, the numerical aperture of the imaging system is 0.2, the illumination aperture corresponds to the numerical aperture of the imaging system, the illumination of the sample is carried out with partially coherent light at σ ~~[[≈]]~~ = 0.8, the diameter of the Airy disk in the image is 1.512 μm, the depth of focus is 6.2 μm, the defocusing from image to image is carried out within the depth of focus range at ±1 RE (RE = Rayleigh unit), ±3 RE, and ±0.8 RE or ±6.2 μm, ±18.6 μm, and ±5 μm, and an odd-number quantity of images is predetermined, preferably a quantity of 7, 11, or 21 images.

Claim 31 (currently amended): The method according to claim ~~23~~ 37,

wherein a deconvolution of the image information is provided depending upon the size of the pinhole in the sample in order to exclude the influence of the pinhole size on the results.

Claim 32 (currently amended): The method according to claim 23,

wherein the influence of ~~the~~ a pupil of the imaging system is taken into account in the evaluation of the image information, preferably by means of a pupil image that is obtained using a Bertrand system.

Claim 33 (currently amended): The method according to claim 23,

wherein ~~the~~ a pupil function is predetermined with respect to apodization.

Claim 34 (currently amended): The method according to claim 23,

wherein a plurality of detection devices are arranged at different distances to the ~~image~~ focus plane and the images are accordingly recorded from the different reference planes at the same time or also successively in time with a corresponding control.

Claim 35 (currently amended): The method according to claim 23,

wherein a plurality of samples arranged adjacent to one another or a sample with a plurality of objects arranged adjacent to one another is positioned in the sample holder and information concerning the image ~~quality~~ qualities of the individual images ~~is~~ are accordingly determined simultaneously in relation to the corresponding positions in the visual field of the imaging system, and/or simultaneous measurements are carried out with a plurality of different wavelengths in order to detect dispersive or wavelength-dependent effects.

Claim 36 (previously presented): The method according to claim 23,

wherein samples with binary objects, i.e., pure amplitude objects, are provided.

Claim 37 (currently amended): The method according to claim ~~23~~ 36,

wherein ~~said~~ each binary ~~objects are~~ object is in the form of a round or square ~~pinholes~~ pinhole.

Claim 38 (previously presented): The method according to claim 23,

wherein the image quality is determined in an automatic process beginning with the positioning of a sample until the output of the characteristic numbers.

Claim 39 (previously presented): The method according to claim 23,

wherein an exposure device is provided which ensures an optimal illumination of the sample depending on the change of the reference plane, and the signal-to-noise ratio is accordingly optimized in the images.

Claim 40 (previously presented): The method according to claim 23,

wherein a laser beam having a beam waist in the object plane is provided for illuminating the sample in order to achieve a low sigma value and a Gaussian intensity distribution in the pupil.

Claim 41 (currently amended): ~~The~~ A method for determining ~~the influence~~ influences of different samples on ~~the~~ an amplitude distribution and phase front distribution of ~~the~~ an illumination light, said method comprising the following steps:

determining ~~the~~ a wavefront deformation characterizing ~~the~~ an optical imaging system ~~in the form of characteristic numbers according to claim 23~~ based on a sample with known, defined optical characteristics;

exchanging the known sample for a sample which is to be examined and whose optical characteristics are still unknown;

determining the wavefront deformation again ~~in the form of characteristic numbers according to claim 23 under the influence of~~ based on the sample to be examined;

determining the influence of the sample to be examined based on ~~the differences of the characteristic numbers for~~ the image quality under the influence of the defined sample and ~~the characteristic numbers for~~ the image quality without the influence of the sample to be examined; and

determining the characteristics of the sample to be examined ~~from the difference of the characteristic numbers~~.

Claim 42 (previously presented): The method according to claim 41,

wherein the image information obtained with the initially still unknown sample is subjected to post-processing in which the characteristics of the imaging system are separated from the characteristics of the sample that was used to characterize the imaging system, and the specific device characteristics are accordingly corrected at the same time when imaging the unknown sample.

Claim 43 (previously presented): The method according to claim 42,

wherein the influence of specific sample characteristics, particularly the size of an observed object, is also corrected from the image information during the post-processing of the image information at the same time.

Claim 44 (currently amended): The method according to claim ~~42~~ 43,

wherein ~~in particular~~ the influence of a stepper in microlithography is factored into the characteristics of ~~a~~ the sample image ~~again by convolution~~.

Claim 45 (previously presented): The method according to claim 41,

wherein lithography masks, including masks with a phase-shifting effect, are provided as samples.

Claim 46-49 (canceled)

Claim 50 (new): The method according to claim 23,

wherein the characteristic numbers are outputted and associated with the imaging system as equivalent for the image quality.

Claim 51 (new): The method according to claim 23,

wherein the characteristic numbers are outputted as Zernike coefficients.

Claim 52 (new): The method according to claim 23,

wherein improving the image quality of the individual images of the image stack is related to improving the signal to noise ratio.

Claim 53 (new): The method according to claim 23,

wherein an initially still unknown sample is recorded by the optical imaging system and the sample characteristics are separated from the characteristics of the imaging system.

Claim 54 (new): The method according to claim 53,

wherein the influence of a stepper in microlithography is factored into the characteristics of the initially still unknown sample image.

Claim 55 (new): The method according to claim 41, further comprising:

determining the influence of the sample to be examined on the phase front distribution of the illumination light.

Claim 56 (new): A method for separating sample characteristics from characteristics of an imaging system comprising the following steps:

obtaining a measured image stack of the imaging system;

calculating a simulated image stack; and

separating images of the measured image stack from corresponding images of the simulated image stack to obtain images of the measured image stack that are freed from the characteristics of the imaging system.

Claim 57 (new): The method according to claim 56,

wherein the images are separated by deconvolution.

Claim 58 (new): The method according to claim 56,

wherein the images are characterized by the image quality that is determined in the form of characteristic numbers.

Claim 59 (new): The method according to claim 58,

wherein the characteristic numbers of the image quality for the sample are determined from the measured image stack.

Claim 60 (new): The method according to claim 56,

wherein sample characteristics are outputted concerning spatial amplitude distribution, spatial intensity distribution, or spatial phase distribution..